SURVEY RESULTS

Analysis of Final Dispositions

A total of 6,800 cases were used in the 1999 study. The final disposition of the cases is presented in Table 4. A total of 686 cases were converted from refusals to completed interviews.

Other languages encountered with frequency were Asian/Cantonese and Polish.

Following is a list of definitions for the terms that appear in Table 4.

- **Completed Interview -** completed, including all critical items
  Refusal - final refusals or cases in refusal when field period ended
- **Language -** Unable to conduct interview as language was not English or Spanish
- **Partial interview -** Only a portion of items completed. No cases were partial at the close of data collection.
  Business - a non-residential phone number
- **Other NIR -** aside from final refusals, includes cases where a household member was never contacted; contact was made but the respondent was not screened; respondent was screened but interview was not conducted.
- **Missed appointments -** No missed appointments remained at the close of the study.
- **Maximum calls -** a total of 14 calls made at different points in the day and week resulted in no contact. Upon reaching "max calls" a case is not worked unless upon review it is reinstated by the supervisor.
- **Ineligible -** 67 cases included five households where the respondent was under 18 years of age and 62 cases where the respondent was incapacitated.
- **Spanish needed.** No cases remained in need of Spanish interviewers at the close of the study.
- **Data line/cellular phone -** this code combines cases where a computer, fax, or alarm tone was reached as well as cellular phones.
- **Second household line -** not the main number of the household. Such cases are not interviewed.
- **Phone problem -** this code was instituted for this study to account for cases (4 17) where multiple attempts (max calls) were made without contact and no answering machine message was left. Such cases can be telephone numbers which have not yet been reassigned but which do not have the message " temporarily out of service" activated.
- **Disconnected phone -** a telephone with the message ' temporarily out of service".

Following are definitions for the terms used to describe Ineligible Cases in Table 4:

- **Second home-** Not the permanent residence of the respondent.
- **Household under 18 years old-** Respondent did not meet minimum age requirement for the study.
- **R died after screener. No** cases.
- **No available HH member - No** cases.
- **R incapacitated-** Respondent unable to participate during data collection period.
- **Not HH, only no answers - Same** as 13 above.

Following are definitions for the terms used to describe reasons for other NIR (Non-Interview Response) in Table 4:

-- **Non contacts with HE member-** No person belonging to the household was reached.
Contact made, not screened - Respondent would not cooperate with the screening process.
-- **Screened, Interview not completed -** No questions from the interview were begun.

Table 4. Final Disposition of Cases.

Total Cases				
Pct of total	Number	Sample Status		NORC Category
28	1,884	Completed interview	I	19/0
12	815	Refusal--all	R	
2	104	Language	IE2	/1
0	0	Partial interview	P	
12	817	Business	NH	29/0
3	231	Other NIR	O	
0	0	Missed appointments	NC	
0	0	Maximum calls	UH	
1	67	Ineligible	IE	
0	0	Spanish needed	O	
8	538	Data line/cellular phone	NH	
1	67	Second HH line	NH	
6	417	Phone problem	NH	33/69
27	1,860	Disconnected phone	NH	/7
100	6,800	Total Sample		
Ineligible Cases Reasons Specified				
Pct of total	Number	Sample Status		
0	0	Second home		
<1	5	HH under 18 years old		
0	0	R died after screener		
0	0	No available HH member		
1	62	R incapacitated		
6	417	Not HH--only no answers		
7	484	Total Ineligible Cases		
Other NIR Reasons Specified				
Pct of total	Number	Sample Status		
1	94	Non-contacts with HH		
<1	33	Contact made—not screened		
1	104	Screened—Interview not completed		
3	231	Total NIR cases		

Analysis of Impact of Selected Cooperation Rate Improvements

Refusal Conversion

The most effective tactic in obtaining completed cases is refusal aversion. The interviewers were trained in techniques designed to gain cooperation which would avert refusals and their subsequent conversion procedures. The first fifteen seconds of the call are crucial to conveying the purpose of the study and gaining cooperation. Interviewers were taught how to control the call, how to respond to anticipated objections, how to deal with rejection and other standard NORC practices. Group discussions with supervisors over which tactics were successful were held and results shared across the interviewers. Case reviews by supervisors resulted in tailored approaches of assigning particular interviewers to convert some cases, calling at a different time or day. Three refusal converters whose conversion rates were not deemed high enough were removed from that task. The institution of respondent fees aided completion of many cases.

"Blitzing", the use of the full complement of interviewers at a later point in the data collection, was employed on a weekend in July. Interviewers who had left the project as the workload reduced were brought back to attempt refusal conversions and add a fresh approach to the work.

A total of 686 cases were converted to completed interviews. Included in this number were calls where the respondent hung up as the preamble was being read. Conversion techniques, therefore, ran the gamut from a cooling off period followed by a fresh call to tailored approaches based on a review of a cases' call notes. This conversion rate is fairly typical of current NORC RDD studies; NORC interviewers' conversions average between 15% and 40%, with amount of burden of the study, sensitivity of questions and respondent fees being contributing factors.

Advanced Mailings

As described above, the sample replicates were released first to the mail shop to post advance letters and then released to the telephone shop per the schedule outlined in Table 5.

Table 5. Release of Replicates by Dates.

REPLICATE RELEASES		
DATE	PHONE SHOP REPLICATES	MAIL SHOP REPLICATES
3/20	--	1-20
3/27	1-8	--
4/3	9-20	21-30
4/10	21-30	31-32
4/17	31-32	33-34
4/24	33-34	

The use of advance mailings whether by regular post or via Federal Express served to increase the number of cooperating respondents. Advance letters were mailed to 2,453 of the 6,800 households in the

sample, with 350 returned for incorrect addresses. Of the 2,103 households which were assumed to have received the letter, 1,019, or 48.5 percent, cooperated in the interview. The number of households not mailed an advance letter was 4,697. Of those households 865, or 18.4 percent cooperated in an interview.

The success rates for the advance mailing were calculated on completed cases, that is "cooperating" cases, which carried the flag for "letter sent". The impact of the letters was confounded by the introduction of the respondent fees. Also, later replicates, numbers 3 1 and 32, had the advance letters delivered via FedEx which generally has a positive effect on cooperation.

Respondent Fee Experiments

Respondent fees were instituted in mid May. Approximately 80 percent of the target sample, 1,599 cases, had been collected prior to this period. All cases completed before the respondent fee experiments began are classified as being in Group 0 (see Figure 1 for a listing of all group conditions). From mid-May, 1999, through the end of data collection, the study went through three different phases: Phase I, a weekend experiment comparing four different conditions; Phase II, in which all respondents were offered a ten dollar incentive; and Phase III, comparing two different conditions.

Phase I Respondent Fees. During the week of May 10, a respondent fee experiment was initiated under the direction of the Chicago Academy of Sciences. Any cases pending on May 13 were available to be assigned to one of four payment conditions: Group 1 --no money offered; Group 2--$10 offered; Group 3--$20 offered; and Group 4--$30 offered.

All 1,300 pending cases on May 12 were randomly assigned to one of the four conditions. On Thursday, Saturday and Sunday the cases in the payment groups were assigned to interviewers with each interviewer working only cases in that condition for their shift. As interviewers made contact with eligible respondents the payment was offered. If the call reached a respondent but did not result in a completion, it remained assigned to the condition group for future calls. The payment conditions were rotated among the interviewers across their shifts during the three days of the experiment. Approximately 35 interviewer hours were devoted to each of the four groups. (Tables 6 and 7 present the results for all fee experiments.)

Only 19 percent of the cases in Group 1 (no incentive offered) resulted in completed interviews during the Phase I experiment, in contrast to 30 percent of both Group 2 ($10 incentive) and Group 3 ($20 incentive) and 50 percent of Group 4 ($30 incentive) (See Table 7). However, none of these differences in proportion of completed interviews are significant given the small number of cases in each of the groups.

Phase II Respondent Fees. In the next respondent fee component, all pending cases, N= 1,176, that had not been reached during the weekend experiment were eligible for a $10 payment for cooperation. These cases were designated as Group 5. These cases included prior refusals who were not reached during the May 13- 17 experiment. This respondent fee condition continued through June 1. During this phase of the study, 18 percent of the cases offered an incentive completed the interview.

On June 2 all respondent fee offers were suspended and on June 4 interviewing ceased except for any cases with appointments. At this point additional funds to continue data collection were requested. Funds were secured with an additional respondent fee plan to be put in place before data collection resumed.

Phase III Respondent Fees. The final experimental conditions were the offer of either $0 or $20 to any remaining cases from the earlier experiments who had not been offered one of the experimental treatments. Of those cases one third had no incentive offered and two thirds had the $20 incentive offered. The cases were randomly assigned to these new groups, Group 6 = $0 and Group 7 = $20.

On June 30 the interviewers to work Groups 6 and 7 were randomly assigned to an experimental group at the start of each shift. During this period cases still in the original Groups 1 through 5 continued to be worked with the original Groups 1 through 5 respondent fee amounts. One to two interviewers would rotate through the few remaining cases in those groups across the various shifts. Groups of cases were worked with interviewer hours proportionate to the number of viable cases in the group.

Upon accessing each case for the first time in this experimental period, the interviewer was instructed to read through the call notes and to review the disposition history. The interviewer would then summarize the attempts to date and in lower case fonts would recommend a pattern or contact strategy to follow thereafter. This summary of call notes enabled cases that had lingered, hidden refusals for example, to be referred to the supervisor for case finalization. This task also enabled supervisors to help interviewers develop possible strategies for the best follow-up tactics.

Each day a supervisor printed a list of cases in each Group in its TNMS location. Call notes were also printed along with any appointments for the group. Supervisors assigned interviewers to one or more locations based on the amount of work available in each one. Interviewers were rotated through groups to avoid interviewer effects. Data collection concluded on August 5.

In the Phase III fee experiments, only eight percent of the cases in Group 6 (no incentive offered) resulted in a completed interview. In contrast, 15 percent of the cases in Group 7 ($20 incentive offered) resulted in a completed interview. Due to the larger number of cases offered an incentive in each of these groups, this difference in the proportion of completed interviews is significant at the .05 level.

Figure 1. Summary of All Respondent Fee Conditions.

Initial Study Period
Group 0, all cases completed before the respondent fee experiment was initiated

Phase I Fee Experiment
Group 1, cases offered $0 during Phase I weekend experiment
Group 2, cases offered $10 during Phase I weekend experiment
Group 3, cases offered $20 during Phase I weekend experiment
Group 4, cases offered $30 during Phase I weekend experiment

Phase II Fee Experiment
Group 5, cases offered $10 during the two-week period following Phase I

Phase III Fee Experiment
Group 6, cases offered $0 from June 3 to the close of study
Group 7, cases offered $20 from June 3 to the close of study

Incorrect Fee Offer
Group 8 contains nine cases in which the interviewer offered a fee that was other than the one indicated in the experiment. For example a Group 7 case, a $20 condition, was incorrectly offered no money by the interviewer.

Table 6. Final Summary Table Figures of Respondent Fee Experiments

Group	Number of Cases Eligible	Number Offered Incentive	Final Non-interview	Final Refusal	Final Complete
			Number of Cases		
Experimental conditions					
Phase I					
1	325	57	29	17	11
2	325	54	22	16	16
3	325	60	25	17	18
4	325	58	11	18	29
Phase II					
5	1,176	560	155	305	100
Phase III					
6	280	278	159	96	23
7	529	529	321	129	79
Incorrect Fee Offer					
8		9	0	0	9
Total	3,258	1,605	722	598	285
Non-experimental condition					
0	0	0	0	0	1,599
Total Completions					1,884

Table 7. Results of Respondent Fee Experiments.

Group	Amount of Incentive	Number offered Incentive	Final Non-interview	Final Refusal	Final Complete
			--Percent--		
Phase I					
1	$0	57	51	30	19
2	$10	54	41	30	30
3	$20	60	42	28	30
4	$30	58	19	31	50
Phase II					
5	$10	560	28	55	18
Phase III					
6	$0	278	57	35	8
7	$20	529	61	24	15
Total		1,596	45	37	17

NOTE: This table excludes those nine cases listed in condition 8 in Table 6 which were offered the incorrect incentive for their condition.

Row percentages may not equal 100 percent due to rounding.

A few respondents, fewer than 10, agreed to cooperate for the stated respondent fee but, upon completion of the interview said no payment or a lesser payment was needed.

Group "0" is noted on the table under the heading "Non-experimental condition." Group "0" consisted of 1,599 completed cases finalized before the institution of the respondent fee experiment. None of these 1,599 cases were offered an incentive, and no cases were categorized as final refusals during this phase of the study, thus no cases are listed in the columns titled *Number Offered Incentive, Final Non-Interview,* and *Final Refusal.*

Interviewer Incentives

Toward the last third of the study, interviewer incentives were instituted. Beginning May 29 any interviewer who achieved three quality completions within their shift was awarded a small monetary incentive. Also, if the team working that shift achieved a team goal, each member of the team was eligible for an additional small monetary incentive. Case goals were set weekly by the project coordinator based on a review of the previous week's production as well as the projected goals established by the project.

Morale of the interviewers was an important consideration throughout the study. Because of the need for a high response rate, 70 percent was the target, refusal cases had to be worked for longer periods since the last two replicates would not be released. Supervisors held weekly meetings to offer encouragement

and to discuss problems with their staff. A pizza party was given in May. Also in May, personal letters of encouragement and thanks were sent to each interviewer along with a copy of the 1998 chapter of the *Science and Engineering Indicators* report.

Response Rate Analysis

The response rate was calculated by applying the American Association for Public Opinion Research standard. It is the number of completed interviews divided by the number of eligible reporting units in the sample. The formula is as follows:

Using the formula I/(I+O) + EI(R+NC+UO)+WRN*EI(UH) we have:

Assume:
- I = complete interviews
- R = refusal
- NC = non-contact
- 0 = other non-interview (partial completed cases included)
- UH = unknown if household
- UO = known household; unknown qualified respondent
- WRN = working residential number rate
- EI = eligibility rate

1884/ (1884) + .92X (8 15+231+0+0+0+0+0) + .92X.46X (O+O+O+O+)) =.66
Where 1884 = completed cases with no partial cases
- .92 = net incidence rate
- 8 15=number of refusals
- 23 l=other non-interview responses
- 46 = accuracy of sample

Yielding a response rate of 66%

Formula for the net incidence rate is:
I+P/I+P+IE where:
- I=completes
- P=partial cases
- IE=ineligible cases

Formula for accuracy of sample is :
I+R+IE+P+O+nC+UO/Total U where:
- I=completes
- R=refusals
- IE=ineligible cases
- P=partial cases
- O=Other NIRs
- nC=missed appointments
- UO=cases under supervisor review
- Total U=all cases in progress

Using this formula the response rate on the study was 66 percent. All of the interviews that are classified as completed interviews are full interviews; none of the completions were cut-off. The hours per case averaged 2.8 and the average length of the interview was 33.37 minutes. Thirty-two interviews, or 1.7 percent of the sample completions were conducted in Spanish. Table 4 displays key data on the final case outcomes.

Estimating Under-coverage of Subpopulations

A summary of the coverage of selected subpopulations based on gender, age, education, and race-ethnicity is provided in Table 8. The coverage of selected populations is determined by dividing the actual, unweighted percentage of total completions for the study by the expected percentage of total completions (based on U.S. Census data[4]). There is only a minor deviation in coverage based on gender, with males being slightly under-covered (96 percent) and females slightly over-covered (103 percent).

The greatest deviation in coverage occurs based on highest level of education. While 2 1.6 percent of the completions were expected to be from those with less than a high school education, only 9.4 percent of the actual completions were from this group, for a coverage rage of 44 percent. In contrast, those with a baccalaureate or higher were over-covered (166 percent). These differences in educational coverage are consistent with the results of other national studies[5].

The greatest deviations in expected coverage based on age occurred for younger individuals. Individuals aged 18 through 24 were expected to represent nearly 14 percent of the total interviews, while they actually represented approximately 10 percent, for a coverage of 71 percent. Those aged 25 though 34 had a coverage of 77 percent. The greatest over-coverage based on age was for those aged 45 through 64 (126 percent).

Hispanic Americans (109 percent) and Other Americans were slightly over-covered (10 1 percent) in the actual completions, while African Americans (89 percent) were slightly under-covered.

The analytic weight (wt5) was developed to account for these deviations in coverage. All analyses using the data from the 1999 study should be weighted by wt5.

Table 9 provides a comparison of the coverage in recent *Science and Engineering Indicators* studies. In general, the patterns in over- and under-coverage evidenced in the 1999 study were also present in other *Science and Engineering Indicators* studies conducted during the 1990s.

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[4] *See* Series P-20, No. 462, *Educational Attainment in the United States: March 1991 and 1990,* U.S. Government Printing Office, Washington, D.C., 1992.

[5] John Brehm (1993), in *The Phantom Respondents: Opinion Surveys and Political Representation,* Ann Arbor: the University of Michigan Press, compared the coverage rates of the General Social Survey (GSS) and the National Election Studies (NES). He found that the GSS (which uses in-person interviews) underestimates individuals with a baccalaureate degree, while the NES (which uses telephone interviews) underestimates individuals with less than a high school diploma.

Table 8. Estimated Coverage of Subgroups.

Subgroup	Number of Cases	Expected	Actual (unweighted)	Coverage*
		--percent--		
Gender				
Male	865	47.8	46.0	96
Female	1,017	52.2	54.0	103
Highest level of education				
Less than high school graduate	177	21.6	9.4	44
High school graduate	1,095	58.8	58.2	99
Baccalaureate or higher	610	19.5	32.4	166
Age				
18 through 24	181	13.6	9.6	71
25 though 34	339	23.3	18.0	77
35 through 44	427	21.1	22.7	108
45 through 64	608	25.6	32.3	126
65 and older	327	16.4	17.4	106
Race-ethnicity				
African American	189	11.2	10.0	89
Hispanic American	157	7.6	8.3	109
Other American	1,536	81.2	81.6	101

Coverage = Actual Completions ÷ Expected Completions

Table 9. Comparison of Estimated Coverage of Subgroups in Recent Science and Engineering Indicators Studies.

Subgroup	Year of Study			
	1999	1997	1995	1992
	Estimated Coverage			
Gender				
Male	96	98	92	96
Female	103	102	107	103
Highest Level of Education				
Less than high school graduate	44	33	53	48
High school graduate	99	102	102	102
Baccalaureate or higher	166	169	147	154
Age				
18 through 24	71	71	60	97
25 through 34	77	88	92	97
35 through 44	108	118	117	125
45 through 64	126	116	113	95
65 and older	106	93	102	83
Race-ethnicity				
African American	89	76	88	80
Hispanic American	109	91	79	47
Other American	101	104	104	108

Coverage = Actual Completions ÷ Expected Completions

Development of Analytic Weights

The SSI random-digit sample has no design effect (a design effect of 1 .O), so it is not necessary to weight for primary sampling units or any other sample stratification. It is important to understand that the basic sample produces a national random sample of households, not respondents. At the conclusion of interviewing, a weight--WT5--was created for each case in the system file. The weighting algorithm was developed to correct for two distortions: first, there are different numbers of eligible respondents in each household, and only one respondent was selected from each household. Second, differential response

rates within an RDD sample produce a disproportionately high number of college graduates and a disproportionately small number of high school dropouts. To correct for differential rates of participation in the interviews, an initial 90-cell weighting matrix was used that includes five age strata, three racial-ethnic strata, two gender strata, and three educational strata. The cells used in the development of the weight match the cells presented in the under-coverage table (see Table 8). Estimates for the U.S. population were obtained from the Bureau of the Census' *Current Population Report?. The 90 cells* were then collapsed into 52 cells to control for cells in which only a small number of respondents occurred. The weight variable WT5 should be used in all analyses producing population estimates for the United States. (See Appendix G for the final weight matrix used for the study.)

DATA EDITING AND FILE CONSTRUCTION

Professor Miller and Dr. Kimmel were responsible for the primary data editing and file construction tasks. The following sections describe the major file construction tasks conducted for the 1999 *Science and Engineering Indicators* study.

Data Editing and Processing

The survey data that were collected were monitored throughout the data collection period. After the first few days of data collection, a preliminary set of data was prepared and placed on the NORC web site, along with the SAS commands that could be used to read the data. Dr. Kimmel downloaded the data and created an SPSS analysis file. Cross-tabulations were run to ensure that all skip patterns were operating correctly. Dr. Kimmel also produced a listing of all open-ended responses, and examined them for any potential problems. A few minor problems were identified with interviewer entries of a few open-ended questions, and these problems were reported to the NORC staff.

Dr. Kimmel retrieved the survey data from the NORC web site on a weekly basis after the initial data reviews. Each week Dr. Kimmel constructed an SPSS analysis file, prepared a preliminary listing of frequencies for all of the variables, and examined the frequencies for any potential problems. The reviews of the frequencies focused on such things as values outside the normal or probable bounds (eg., a respondent's age being listed as under 18 or over 110); values not specified in the questionnaire (eg., a value of 5 appearing for a true/false question, in which only the values of 1, 2, 8, and 7 were expected); as well as unusual patterns of responding based on prior survey results (eg., all respondents indicating that they had a clear understanding of a molecule, or no respondents indicating that they read a newspaper every day). No problems were identified in these reviews.

Coding of Open-ended Questions

The 1999 study included two types of open-ended questions: short answer open-ended questions and long answer open-ended questions. Short answer open-ended questions in the 1999 study include such items as occupation, magazines, college major, and subjects searched for on the World Wide Web. Long

[6] *See* Series *P-20, No. 462, Educational Attainment in the United States: March 1991 and 1990,* U.S. Government Printing Office, Washington, D.C., 1992.